

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (currently amended): A structure, comprising:

a first shaft member, the first shaft member being formed out of a first material, the first shaft member having an outer periphery formed with an axial groove and a circumferential groove, each of said grooves having a cross section having opposed faces substantially parallel to each other;

a second shaft member fixed to the first shaft member via a torsion bar;

a surrounded member formed out of a magnetic material, the surrounded member being fixed to the second shaft member;

a cylindrical member fitted to the outer periphery of the first shaft member, the cylindrical member having a portion facing the surrounded member, the cylindrical member being formed out of a second material, the second material being greater in linear expansion coefficient than the first material, the second material being conductive non-magnetic metallic material;

a torque detection coil detecting a torque acting between the first shaft member and the second shaft member by detecting a change in superimposition of the surrounded member and the portion of the cylindrical member in accordance with an impedance change; and

a caulked portion provided to the cylindrical member partly at an intersection of the axial groove and the circumferential groove,

the caulked portion having a continuous and deformed inner surface in press contact with the opposed faces of the axial groove and the circumferential groove at the intersection, and

wherein the axial groove is greater in depth than the circumferential groove.

2. and 3. (canceled).

4. (previously presented): The structure as claimed in claim 1, wherein a circumferential width of the caulked portion is greater than a circumferential width between the opposed faces of the axial groove at the intersection.

5. (original): The structure as claimed in claim 4, wherein the caulked portion comprises a first caulked part corresponding to the circumferential groove and a second caulked part corresponding to the axial groove, the second caulked part being arranged substantially in a middle of the first caulked part.

6. (original): The structure as claimed in claim 1, wherein the axial groove comprises a plurality of groove portions in a circumferential direction.

7. (original): The structure as claimed in claim 6, wherein the plurality of groove portions of the axial groove are three in number.

8. (original): The structure as claimed in claim 1, wherein the cross section of the axial groove and the circumferential groove is rectangular.

9. (previously presented): The structure as claimed in claim 1, wherein the cylindrical member is apart from the shaft member except the caulked portion.

10. (original): The structure as claimed in claim 1, wherein the axial groove has an opening edge formed at an acute angle.

11. (currently amended): The structure as claimed in claim 1, further comprising an input shaft and an output shaft, wherein the first shaft member comprises one of the input shaft and the output shaft, wherein the second shaft member comprises an other one of the input shaft and the output shaft, the input shaft and the output shaft arranged relatively rotatably with respect to each other, the input shaft and the output shaft being used for a torque sensor of an electric power steering apparatus.

12. - 20 (cancelled)

21. (currently amended): A structure, comprising:

a first shaft member, the first shaft member being formed out of a first material, the first shaft member having an outer periphery formed with at least one ~~of an axial groove and a circumferential groove~~, the at least one axial groove having a cross section having opposed faces substantially parallel to each other;

a second shaft member fixed to the first shaft member via a torsion bar;

a surrounded member formed out of a magnetic material, the surrounded member being fixed to the second shaft member;

a cylindrical member provided to the outer periphery of the first shaft member, the cylindrical member having a portion facing the surrounded member, the cylindrical member being formed out of a second material, the second material being greater in linear expansion coefficient than the first material, the second material being a conductive non-magnetic metallic material;

a torque detection coil detecting a torque acting between the first shaft member and the second shaft member by detecting a change in superimposition of the surrounded member and the portion of the cylindrical member in accordance with an impedance change; and

a caulked portion provided to the cylindrical member at a position corresponding to the at least one axial groove of the shaft member, the caulked portion having a deformed inner surface in press contact with the opposed faces of the at least one axial groove;

wherein the cylindrical member is spaced apart from the shaft member by a clearance except at the caulked portion position corresponding to the at least one axial groove.

22. (previously presented): The structure as claimed in claim 10, wherein the axial groove has the opening edge formed at the acute angle at the intersection.

23. (previously presented): The structure as claimed in claim 21, wherein the clearance is sufficient to loosely fit an inner periphery side of the cylinder over the shaft outer surface.

24. (previously presented): The structure as claimed in claim 23, wherein the clearance is established at ordinary temperature.

25. (new): The structure as claimed in claim 1, wherein the caulked portion is provided to the cylindrical member, only at the intersection of the axial groove and the circumferential groove to couple the cylindrical member with the first shaft member.

26. (new): The structure as claimed in claim 21, wherein the first shaft member has the outer periphery formed with a plurality of axial grooves, and

the clearance exists between caulked portions which are provided to the cylindrical member at the positions corresponding to the plurality of axial grooves.